

# LABORATORY FOR EXTRATERRESTRIAL PHYSICS

Code 692

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## New Views of Magnetic Fields in the Heliosphere

- We found, using a 3-D magnetohydrodynamic simulation code, that the standard “Parker” spiral interplanetary magnetic field is significantly modified in the region near the ecliptic where the field changes polarity (at a “sector boundary”).
- Due to flows induced by the magnetic field changes across the boundary, the transition in the field is not a simple change in sign, and the fields in the two sectors are connected. This is not a dynamical “reconnection” process, but an unexpected steady state configuration that may also be relevant in the solar corona and the Earth’s magnetosphere.
- Comparisons with Helios data show that the code produces realistic detailed time series, and thus will provide a powerful quantitative means for studying heliospheric dynamics.
- Knowledge of the topological connectedness of field lines will be important for “space weather” studies, in particular for determining the paths of energetic particles coming from the Sun.

The left image shows simulated field lines (yellow and red), with loops. The blue region on the green sphere indicates the region of the “sector boundary” between magnetic polarities. Magnetic field time series from a point in the simulation are shown in the upper right, with Helios data shown below right.

